PROFILE
PUBLICATIONS

The Vickers Wellington I & II

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Wellington I, L4272, of No. 149 (East India) Squadron; Mildenhall, Suffolk, U.K., July 1939.

Wellington I, N3000, of No. 9 Sqdn.; Honington, Suffolk, early 1940.

Wellington I, L4345, of No. 214 (Federated Malay States) Sqdn.; Feltwell, Norfolk, U.K., during Annual Air Defence Exercises, August 1939. White cross indicated "Westland", the friendly force.

Wellington IA, N2912, of No. 215 Sqdn.; Bassingbourn, Cambridgeshire, U.K., early 1940.

Wellington IC, R3206, of No. 149 (East India) Sqdn.; Mildenhall, Suffolk, June 1940.

Wellington IC, R1042, of No. 150 Sqdn.; Newton, Nottinghamshire, U.K., Winter 1940/41.

Wellington IC, T2473, of No. 9 Sqdn.; Honington, Suffolk, late 1940.

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The Vickers Wellington I & II

by C. F. Andrews

Typical scene on a wartime Bomber Command station; a Wellington Ic of No. 149 Squadron bombing up.
(Photo: Vickers-Armstrongs)

The Wellington fully justifies its inclusion among the truly great aircraft of all time, not only because of its impressive war record and long operational life but also because it played a decisive part in formulating bomber policy in the critical years before Munich. It is a fair claim that from the original specification for the B.9/32 Wellington sprang the massive R.A.F. bomber force of World War II, largely because of the technical advances made during the design stage in modernising operational requirements.

The story of the Wellington began in October 1932, when Vickers were invited by the Air Ministry to tender to specification B.9/32 for a twin-engined medium day bomber. In the subsequent design study submitted by Vickers, geodetic construction as used on the single-engined G.4/31 Wellesley day bomber was made a special feature.

This confidence in geodetic construction, which had been devised by Mr. B. N. Wallis, Vickers' chief structures designer, was engendered even before operational experience had been gained with the Wellesley. This had undergone structural strength tests at the R.A.E. Farnborough which produced remarkable results. The required factor was six but the testing continued until a figure of 11 was reached without any sign of failure, which was far in excess of normal strength factors. In the B.9/32 further development of structure design led to a reduction in size of the individual members and these were formed into standard sections of simpler and lighter construction.

Those were times of great change in the aircraft industry. The arguments, discussions and experimental work towards better aerodynamic, structural, metallurgical and motive power efficiencies that had taken place since the end of World War I had reached fruition. The way was open for a major step forward but certain outmoded requirements had to be brought up to date. In previous tenders for new designs, it was mandatory that the tare weight of the required aeroplane should be strictly adhered to, which obligation restricted the designer by limiting the structural weight and also the weight and power of the engine. This tended to produce slow and inefficient weight-carrying aircraft.

Mr. R. K. Pierson, Vickers' chief designer and his partner Mr. B. N. Wallis, were convinced that the bomber should be equipped with the most powerful engine available. During the period between the submitting of the B.9/32 tender in 1933 and the completion of the prototype in 1936, the tare weight rose from 6,300 lb. to 11,508 lb. This meant in effect that the Air Ministry had accepted the advice of the Vickers design team and had removed the crippling terms of their specifications.

While design of the B.9/32 was in progress, the political and military climate of Europe was changing rapidly. The threats of the dictators of Germany and Italy began to exert pressure on the British Government to make a reappraisal of the strength of its armed forces, especially that of the Royal Air Force.

The potential offered by the B.9/32 design was the subject of new concepts of bomber policy. From 1933 onwards its bomb load and range were being constantly revised. As early as November 1935, the Air Staff were enquiring about the possibilities of using the aeroplane at an all-up weight of 30,500 lb. with assisted take-off—a very high figure for a medium bomber of those days.

By 1936, it was realised that the priority requirement was to provide the largest number of bombers—the spearhead of attack—in the shortest possible time, to form the nucleus of the new Bomber Command of the Royal Air Force. In fact, an initial order for 180 Wellingtons was placed in August 1936, before the

first meeting to decide the details of the production aircraft.

The following year, 1937, was crucial for Vickers. Besides the pilot order to the parent company, a contract was placed during October with the Gloster Aircraft Company for 100 Mark I Wellingtons with Bristol Pegasus engines to be followed by another 100 Mark IIs with Rolls-Royce Merlin Xs. Some time later, an order for 64 Wellingtons was placed with Sir W. G. Armstrong Whitworth Aircraft of Coventry. In the event, these orders were eventually transferred to the Chester and Blackpool works of Vickers-Armstrongs when the "shadow" factory scheme was introduced.

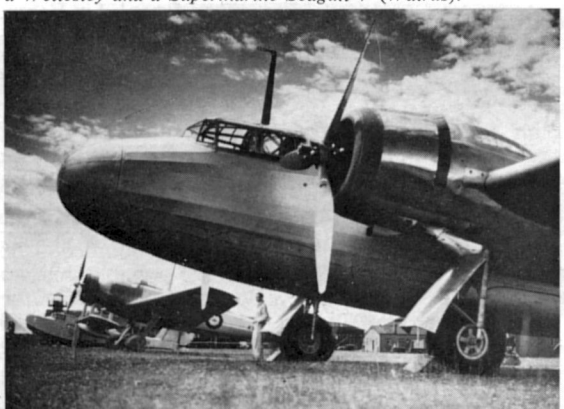
With production of the Wellington assured, Vickers were faced with the problem of making the manufacturing process as simple as possible. They responded by announcing their target of one aeroplane per day every day. An actual exercise of this was carried out when a complete Wellington airframe was assembled in 24 hours. This feat had never before been attempted by a British aircraft manufacturer in metal construction with so large an aeroplane.

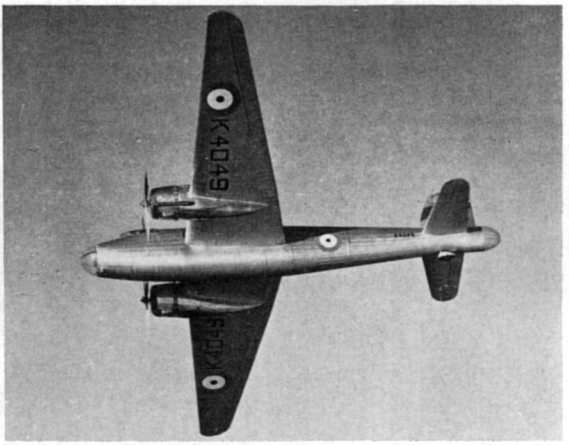
Critics of the geodetic form of construction, while accepting its high strength/weight ratio and ingenuity, condemned it on the grounds that for quantity production it was impracticable and would take too much production time. But Mr. Wallis, whose baby it was, together with the Weybridge production team valiantly led by Trevor Westbrook, devised the necessary tools and methods for producing the numerous parts which went together to make up the complete airframe. The real proof of the essential simplicity of the Wellington structure, not obvious from a cursory inspection, was proved by its subsequent extensive production in the factories at Blackpool and Chester, which, between them, turned out 8,940 airframes with a minimum of key personnel, the bulk being semi-skilled workers new to aircraft construction.

A civil version of the Wellington was prepared as a design study for Mr. Nigel Norman of Airwork in May 1939, and in September of that year, two

Head-on view of the Wellington I prototype, L4212, *before the first flight on 23rd December, 1937.*

Nose and cowling detail of the B.9/32, with "faired" nose turret, as seen at the Hendon Air Display of 1936. In the background, a Wellesley and a Supermarine Seagull V (Walrus).





The B.9/32 prototype, with Vickers cupola-type turrets.
(Photo: Vickers-Armstrongs)

representatives of British Airways (the pre-war airline eventually merged with Imperial Airways to form B.O.A.C.) visited Weybridge to discuss a civil version for use on the West African route, with the possibility of an extension across the South Atlantic. Another study was submitted to the Air Ministry for a transport version, providing for a maximum of 13 troops without a navigator or, alternatively, 11 troops with a navigator. At that time the New Zealand Government was re-equipping its Air Force, and ordered 18 Wellingtons.

With the higher cruising speeds of the Wellington, it was realised that the old type exposed or semi-exposed type of gun mounting would have to give way to a totally enclosed turret. More important still, such a turret would have to be power-operated if it was to be effective against opposing fighters moving in at high speed and capable of rapid positional manoeuvres.

These turrets caused some hard thinking and absorbed many man hours in design. Vickers, like other aircraft manufacturers, were convinced that with their long experience of aircraft hydraulics they were capable of designing turrets themselves. But the more the basic problems were gone into, the more evident it became that gun turrets were a specialised subject which required undivided attention. The Air Ministry then insisted that they were to be ancillary equipment designed and supplied by independent manufacturers. This decision relieved the airframe designer of a large amount of detail design work and also led to a certain degree of standardisation between British bombers.

During 1935, the "shadow" group of Government-sponsored factories for the quantity production of airframes and aero-engines in the event of war was proposed. Their function was to produce in quantity any type of airframe or engine that had been officially "frozen" in design. This, in turn, allowed the parent firm to develop new or improved types and, in time, to place them with the shadow factories for production. So it was hoped, there would be a continuing technical advance, keeping the production of military aircraft abreast of operational requirements.

As regards the Wellington, there is no doubt the system proved eminently successful, for more of the type were produced than any other British bomber and their diversity of operational rôle was wider. Wellingtons, in fact, served in all flying Commands except Fighter, and the massive support in production

The first Wellington I takes off on its maiden flight from Brooklands. (Photo: Vickers-Armstrongs)

rendered by Vickers' factories at Chester and Blackpool proved, in the event, of the greatest value to the parent works at Weybridge, particularly after the enemy action there in September 1940.

Just recognition must be made here of the notable contribution that the unique system of geodetic construction, devised by Dr. Barnes Wallis, made to the war effort of Britain. Many an aircrew survived to tell the tale of the apparent invulnerability of the Wellington, including many members later in important commands in the Royal Air Force. The engineering term 'fail safe' is a more recent introduction but never has it been more justified and earned than by the Wellington.

Production of Wellington Mark I's in 1938; an excellent view of the characteristic geodetic structure.

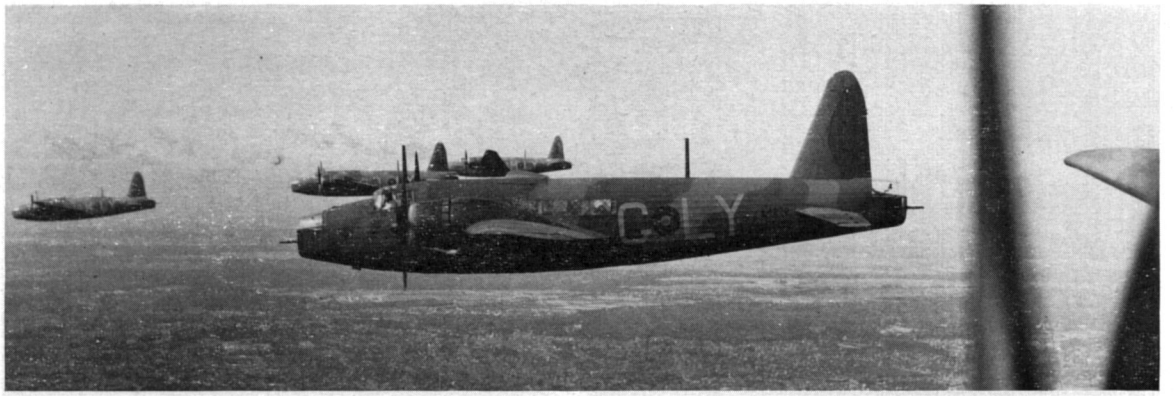
B.9/32

The invitation to submit a design study to specification B.9/32 came from the Air Ministry on 20th October, 1932. In the following December the estimated tare weight of this bomber project was increased from 6,300 lb. to 6,500 lb. A comparison of the respective performance details of the Bristol Pegasus IS2 or IIS2 and the Armstrong Siddeley Tiger engines was settled in favour of the Pegasus, that is, for the air-cooled engined version of the bomber. For the liquid-cooled engined variant of the basic project, the Rolls-Royce Goshawk I was selected.

These two versions were submitted in tender designs on 28th February, 1933. In September following, the Air Ministry placed a pilot contract for a bomber with Goshawk engines. The actual works order was dated later—on 12th December, 1936. Meanwhile the tare weight had remained at 6,500 lb.

By this time the revised specification included front, rear and midships gun mountings with wind protection. The proposed aeroplane was also altered from a high to a mid-wing configuration, to give a better view to pilots flying in formation, which modification also improved the aerodynamic characteristics. The

Mark I's of No. 9 Squadron, R.A.F. at the Brussels Aero Exhibition of 1939. (Photo: Vickers-Armstrongs)

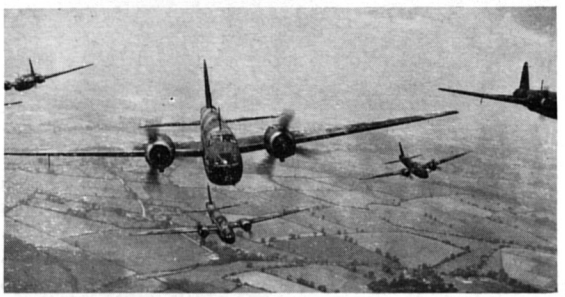


"Showing the flag" over Paris on July 14th (Bastille Day) 1939; a formation of No. 149 Squadron's Wellington I's.
(Photo: Charles E. Brown)

revised specification also called for the modification of bomb undershields, and the incorporation of spring-loaded bomb doors. The oil system was also revised and permission to raise the tare weight to 6,798 lb. was requested.

This increased weight was accepted in principle, so the detail design proceeded while the ancillary installations became progressively more complicated, as a result of production and operational requirements. The fixed weight penalty became apparent, and by June 1934, the Air Ministry had cancelled the prohibitive tare weight limit of 6,500 lb.

In August 1934 Vickers submitted proposals for using the more powerful Bristol Pegasus or Perseus air-cooled engine in place of the Goshawk, which promised considerable improvement in speed, climb, ceiling and ability to fly on one engine, without a correspondingly serious increase in all-up weight.



Two photographs showing views of No. 9 Squadron's Wellington I's in formation. Note squadron crest, and turret details. No. 9 Squadron took part in the famous raid on German shipping at Brunsbüttel on September 4th, 1939; the second R.A.F. bombing mission of the Second World War.

It was also hoped that the delivery date of the first aircraft could be brought forward. The Air Ministry quickly accepted these proposals, and took the opportunity to increase the fuel load to provide a range of 1,500 miles at 213 m.p.h. at 15,000 ft. The Pegasus engines were to be fitted with variable pitch propellers, and following wind tunnel tests conducted by Vickers, their own nose and tail turrets were also accepted.

The loaded weight by this time was mounting rapidly following the removal of the restrictive fixed tare weight. Indicative of this was another design study using Rolls-Royce Merlin engines, which was carried out for the Air Ministry at an all-up weight of 17,850 lb.

The first flight of the prototype B.9/32—*K4049*—was made at Brooklands on 15th June, 1936 by Captain J. "Mutt" Summers, Vickers chief test pilot, accompanied by Mr. B. N. Wallis and Trevor Westbrook. It was powered with two 915 h.p. Bristol Pegasus X engines which gave a speed of 250 m.p.h. at 8,000 ft. at an all-up weight of 21,000 lb. The span of the aeroplane was 85 ft. 10 in. and the length 60 ft. 6 in. An interesting point in design was the "borrowing" of the profile shape of the Vickers-Supermarine Stranraer fin and rudder, to save time in design hours.

A crew of four was provided for, with allowances for one supernumerary for special duties. The bomb load was nine 500 lb. bombs or nine of 250 lb. for long range operations. Nose and tail gun stations were fitted for single guns in each. These "cupolas" were hand-operated, but there was provision for a third gun with a retractable shield to be mounted in a dorsal position halfway along the fuselage.

The aeroplane, the Vickers B.9/32, was rightly regarded at that time as the most advanced design of its day, and its subsequent flying trials proved beyond

Striking overhead view of a Wellington I on test. Note upper surface structural details.
(Photo: Flight International)

doubt that it was of exceptional merit and that a production order would follow as a matter of course.

But before its trials were fully completed it met with an unfortunate accident while undergoing Service tests in April 1937. The horn balance of the elevator was of the type which was shielded at small angles of trim but was exposed to the slipstream at full travel. In this condition, excessive load caused the failure of the horn balance and the aeroplane turned on to its back. The pilot was thrown through the roof of the cockpit and escaped by parachute but the flight engineer was unable to get free, and was killed in the crash, which completely destroyed the aeroplane.

The name "Crecy" was originally chosen for the B.9/32 on 5th June, 1936 and it was publicly shown as such in the New Types Park at the Royal Air Force Display in that year, but on 8th September the name was changed to "Wellington". In a later explanation Mr. Pierson said that it was correctly named after a town according to Air Ministry nomenclature, but the permanent name also perpetuated the memory of the "Iron Duke", and followed tradition in that its geodetic predecessor bore the Duke's family name, Wellesley.

WELLINGTON MARK I

At the first meeting to discuss production design requirements, the main details were decided for the Mark I Wellington. The engines selected were the Pegasus XVIIIs, with allowance for the Pegasus XXs in event of delays in developing the two-speed supercharger intended for the Mark XVIII. The fuel capacity was fixed at 696 gallons maximum, and the maximum bomb load at 4,500 lb. while the all-up weight was estimated at 21,000 lb.

Defensive armament comprised bow and stern power-operated turrets plus a ventral retractable and revolving turret midships, all mounting two 0·303 in. Browning guns. These turrets were of Vickers design, but the Air Ministry asked that the Frazer-Nash control unit should be used as it was being developed to a highly satisfactory degree at that stage. Provision was made for 600 rounds of ammunition for the front turret and for 1,000 rounds for each of the mid and rear turrets.

There was provision for cockpit heating and de-icing, and it was agreed that cabin heating should be developed and introduced at a later stage. The de-icing was classified as ancillary equipment and was also to be installed as development proceeded.

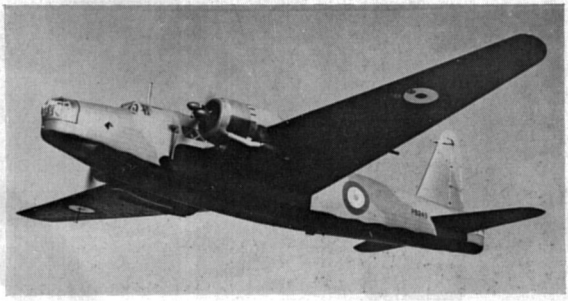
The propellers initially fitted were of the de Havilland-Hamilton two-pitch type, but the possible development of the constant speed type with increases of up to 20 degrees pitch was to be kept in mind, and fitted when available. Dual control conversion sets were stipulated, indicating that dual control training was to be a priority with the first aircraft to be delivered to the Royal Air Force.

A special discussion on the fuel system took place at Weybridge on 14th December, 1936. The geodetic construction of the wing offered a unique method then of stowing the fuel. The unobstructed space between the front and rear spars was available outboard of the engine nacelles, and three separate tanks were installed in each wing. Each tank was piped independently to a collector box in the bottom of the fuselage, each pipe entering through a non-return valve, so isolating each tank.

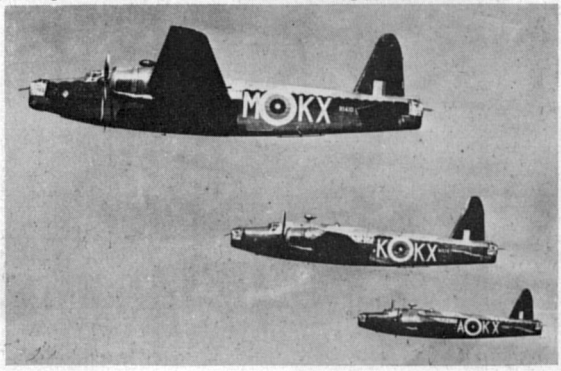
As a result of numerous other meetings and the flying experience gained with the B.9/32 while it existed, a new specification, 29/36, was issued in

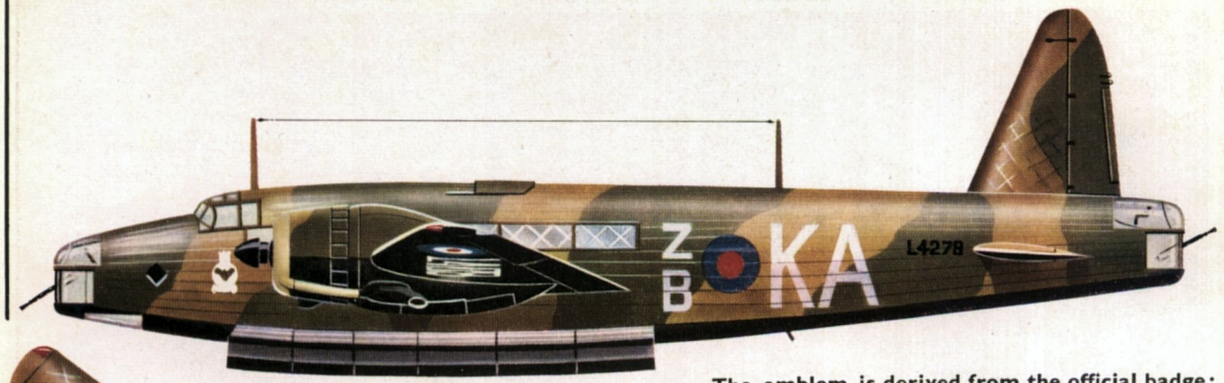
(*continued on page 10*)

A Weybridge-built Wellington Ic on a test flight. Compare nose turret with preceding illustrations.



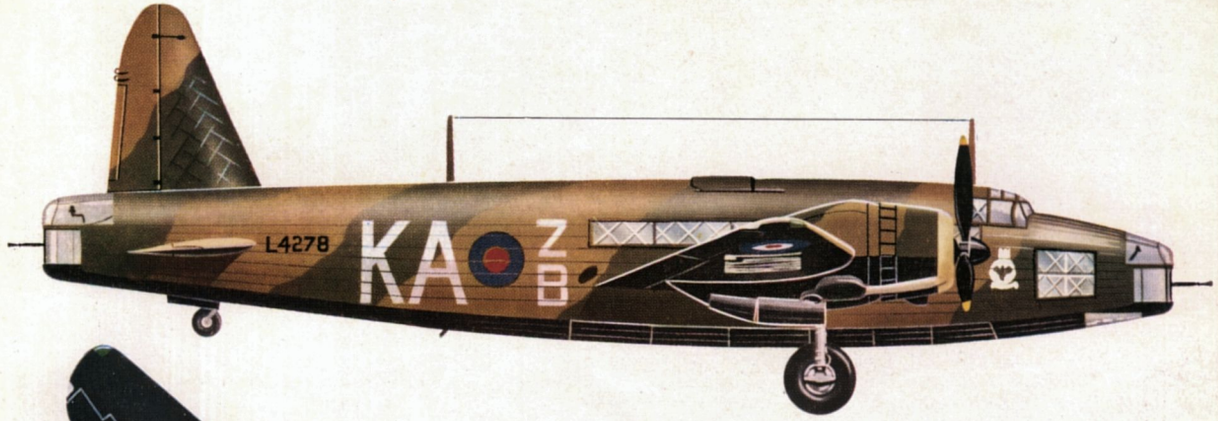
A flight of No. 311 Squadron Wellington Ic's; note modified fuselage roundels. (Photo: Imp. War Mus. CH 2265)

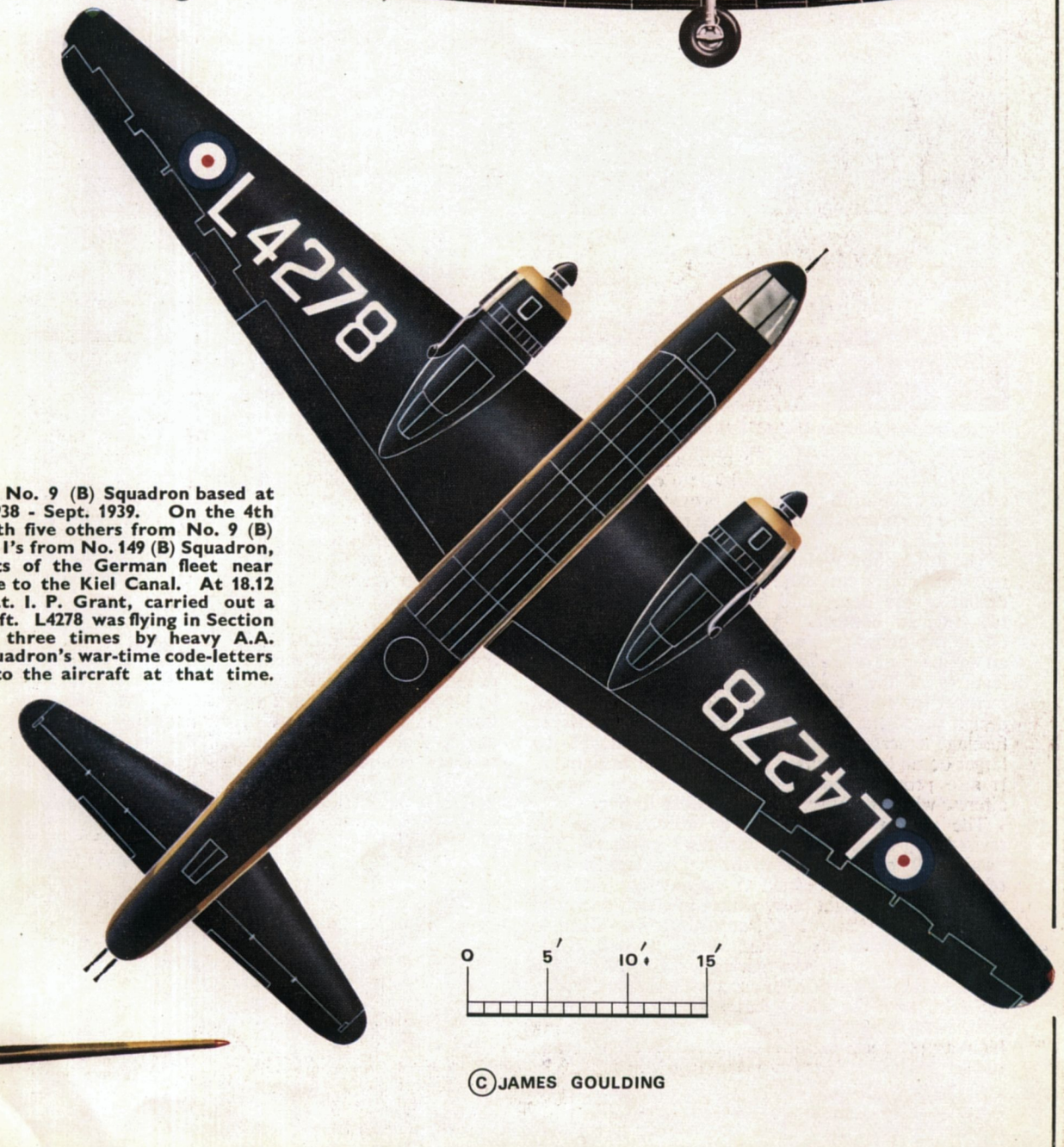


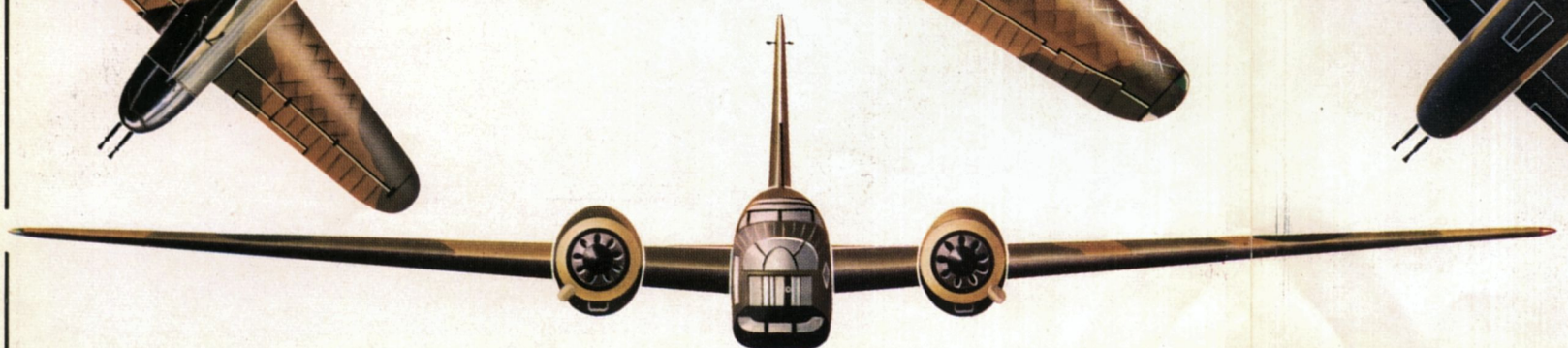


The emblem is derived from the official badge; the motto is translated as "Throughout the night we fly". The Green Bat is probably symbolic of the Squadron's long association with heavy night bombers in 'nivo' green paint finish, particularly Vickers Virginias.

WELLINGTON I, L4278, of No. 9 (B) Squadron based at Honnington, Suffolk. Late 1938 - Sept. 1939. On the 4th Sept. 1939, this aircraft, with five others from No. 9 (B) Squadron and six Wellington I's from No. 149 (B) Squadron, took part in a raid on units of the German fleet near Brunsbuttel and the entrance to the Kiel Canal. At 18.12 hrs., L4278, flown by Flt/Lt. I. P. Grant, carried out a successful attack from 6,000 ft. L4278 was flying in Section 4 of the raid, which was hit three times by heavy A.A. fire. It is not known if the Squadron's war-time code-letters of "WS" had been applied to the aircraft at that time.







©JAMES GOULDING

Fine study of Wellington II, W5461 *of No. 104 Squadron. The squadron received its Mk. II's in April 1941; this aircraft failed to return from Berlin on the night of 12th/13th August of that year.*

The prototype Wellington II, L4250 *in its original form.*

February 1937, to cover the production version of the Wellington. This specification could be described as an interim measure to provide as quickly as possible the aircraft required for the rapidly expanding Royal Air Force.

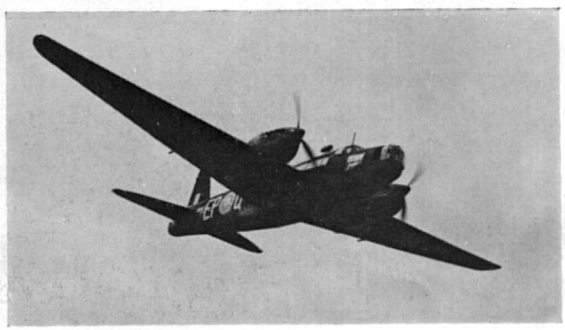
The production Wellington Mark I was a complete redesign, and went hand in hand with the detail design of the larger and heavier B.1/35 (Warwick) twin-engined bomber. As a result, large portions of the two aeroplanes were common to one another, an engineering operation made easier by the singular features of the geodetic structure with its special member-forming machinery. This parallel detail design suited the Wellington admirably, for a deeper fuselage emerged which nicely accommodated the larger bomb load required with associated equipment. It also provided better disposition for the regular aircrew who were increased in number to five.

The nose was lengthened to accommodate the revised gun turret and bomb aimer's position. The "waisting"* on the B.9/32 in the rear fuselage forward of the tail unit was deleted in the redesign, and was replaced by a straight taper which, in effect, deepened the rear end. Accordingly, advantage was taken to lift the tailplane six inches which gave a better position on the deeper fuselage. The redesigned horizontal tail unit of high aspect ratio also involved the deletion of the horn balances of the B.9/32. This unit, with the deep fuselage and tapered wings of high aspect ratio and with the tall single fin and rudder assembly, became a characteristic feature of the Wellington—which perhaps was just as well in view of the elementary state of aircraft recognition early in the war.

Constant speed propellers were introduced, and another up-to-date feature at that time was the fitting of a retractable tailwheel. Meanwhile, Frazer-Nash turrets had made further progress during the redesign of the Wellington, and the Air Ministry requested the replacement of the Vickers ventral turret midships with one of Frazer-Nash design. This was heavier than the Vickers type, and there was consternation when Mr. Pierson produced data showing that the aeroplane C.G. position with this alternative turret was extemely critical. The outcome was a decision to fit the F.-N. turret to the first production aircraft only, compensating by ballast to obtain the required flying characteristics during handling trials.

The first Mark I, *L4212*, was first flown by "Mutt" Summers on 23rd December, 1937, at Brooklands, powered by Bristol Pegasus XXs—the Mark XVIIIs had not then completed type trials. An intensive flight programme followed, unfortunately held up during February and March 1938 by an undercarriage failure caused by the misalignment of a

Another 104 Squadron Mk. II, W5437 *EP-Q. Based at Driffield as part of No. 4 Group, this unit took part in the night bombing offensive over Europe until the autumn of 1941, when it moved to the Middle East.*



* *An aerodynamic "gimmick" current at that time, thought to reduce drag. A primitive form of area rule which was not proven in practice.*

Wellington II/T2545 with Type 430 modification, as the Rolls-Royce Merlin 60 test-bed. (Photo: Rolls-Royce)

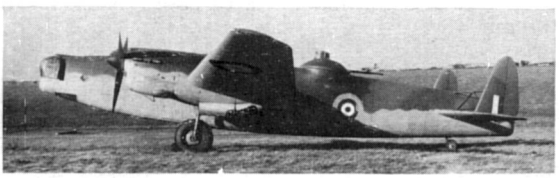
toggle strut. While repairs were being carried out the Pegasus XVIII became available and was installed, the whole repair and engine change being completed by 12th April when test flying was resumed.

During the flight trials with *K4049*, the basic aeroplane had been found aerodynamically stable and to possess considerable self-righting properties. Therefore, it seemed fairly safe to assume that the production Wellington I would have similar characteristics but when conducting diving trials on *L4212* it was discovered that the aeroplane was nose heavy in the dive. This was a serious matter. An immediate investigation was held and the trouble traced to the elevator arrangement. In place of the horn balance of the B.9/32 the elevator had been redesigned with the hinged position at its leading edge, and balancing was affected by tabs plus a reserve tab for trimming.

Vickers and the R.A.E. could not agree on the solution, Vickers wishing to return to the horn type of balance and the R.A.E. recommending the inset type of hinge arrangement. Consequently a decision was made to experiment with both systems.

The new elevator with horn-balanced areas was fitted and flown on *L4213* on 9th September, 1938. Then followed a series of modifications involving a small increase in horn balance and trim tab areas, the latter mass balanced, while chord of the wing flaps was shortened, and they were interconnected with the elevator trim tabs. These modifications provided the necessary handling qualities at that stage.

In the meantime, engine availablilty determined the next developments of the Wellington. The Mark II (supplementary specification Wellington 2P1) was to be fitted with Rolls-Royce Merlin Xs, and the Mark III (3P1) with Bristol Hercules IIIs. As some time was obviously to elapse before these two types of engine could be available in production form, a decision was made to anticipate some improvements intended for the two later Marks by introducing these in variants designated IA, IB and IC.



MARK IA

In the supplementary specification written for this variant (Wellington IAP1) it was stated that the design was to be in accordance with that of the Mark II. Therefore, the IA was based in fact on the then unborn Mark II and not, as has been generally supposed hitherto, on the Mark I. Another interesting fact was that the engines were to be interchangeable, Pegasus or Merlin, but this scheme was never pursued, the Pegasus X being fitted exclusively.

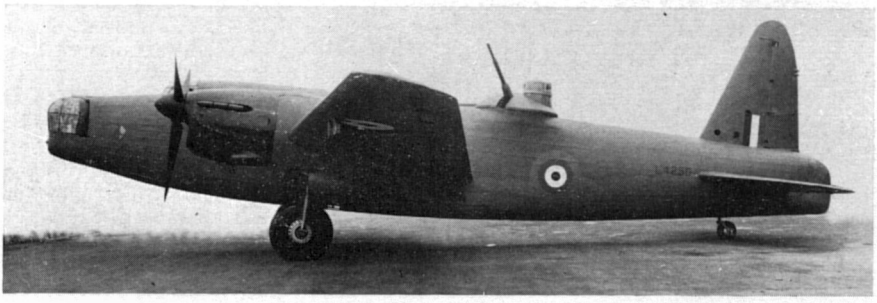
Salient features of the Wellington IA included Frazer-Nash turrets in the bow, midships and stern positions, an airframe stressed at the all-up weight of the Mark II—28,000 lb.—and a strengthened under-carriage to allow for the increase in all-up weight. The wheels were increased in diameter and the chassis was also moved forward three inches to improve the centre of gravity characteristics of the aeroplane. The bomb gear and oxygen supply were also redesigned as the system of the Mark II.

MARK IB

A Wellington IB was proposed as a result of difficulties experienced with the armament. The Vickers type bow and stern turrets gave considerable trouble during firing and other operational trials. These difficulties, combined with the C.G. problems caused by the F.-N. ventral turret added up to a situation in which the Wellington was defensively weak, and one which obviously could not be tolerated. Consequently, with the deletion of the ventral turret on all Wellington variants and the general introduction of the F.-N. bow and stern turrets, the Mark IB, intended as an armament "trial horse" was to all intents and purposes identical with the IA, and so never appeared in Vickers production records. Some doubt exists as to whether any IBs were, in fact, ever completed and if so, they must have been quickly re-classified as IAs.

MARK IC

In the Mk IC variant, all the development experience that had been accumulated to that time was incorporated. The redesigned hydraulic system, using V.S.G. pumps, being developed for the projected



Mark II L4250 *with 40 mm. Vickers cannon installation and (above) as it appeared with dorsal cannon and twin-fin layout, modified from single-fin layout (below).*

The Polish eagle on an English hangar; a Wellington II of one of the four Polish-manned bomber units which served with distinction in the R.A.F., in this case No. 305 (Ziemia Wielkopolska) *Squadron. Note the Polish Air Force flash on the nose of the aircraft, coded SM-C.*
(Photo: R.A.F. Polish Film Unit)

Type 297 Wellington, was introduced, together with a 24 volt electrical system required to operate the D.R. (directional radio) compass. The engineering evolution of the Wellington IC was one of those examples of ingenuity which have always characterised the British aircraft industry. The merits of combining new hydraulic and electrical systems, demanded by the rising standard of operational requirements, in one variant instead of two was due to the initiative of Trevor Westbrook then in executive control of production at Weybridge. In consequence of this independent action, approved at a local technical committee meeting, type records had to be written up some time later to put the designation IC in order higher up the scale, and to remove the embarrassment of a variant that officially did not exist.

One of the most important modifications introduced on the Mark IC, and subsequently incorporated on all Marks, was the substitution of beam guns in the midships position for the unsatisfactory ventral turret. The whole Wellington I sub-type position was finally cleared up by this modification, and on 19th August 1940, the Air Ministry issued a directive which said, "Mark IA and IC aircraft on which the mid-turret has not been fitted are to be considered as the standard aircraft for their respective types." It is significant that the proposed IB was not mentioned.

A typical Wellington crew of the early war years; note details of the Frazer Nash tail turret, and the style of fin flash on the leading edge of the vertical tail surfaces.
(Photo: Vickers-Armstrongs)

Beam guns of Vickers "K" type were installed on the Wellington Mark IA *P9211* which was flown to Boscombe Down for trials the Aeroplane and Armament Experimental Establishment having been moved there from Martlesham Heath, Suffolk early in the war, owing to Martlesham's vulnerability to enemy attack after the invasion of the Low Countries. Boscombe was to become as much a "household" word in aeronautics as Martlesham had been before. The A. and A.E.E. recommended, as a result of firing trials, that Browning 0·303 in. guns should be used instead of "K" guns and that the beam gun position should be moved further aft. Some IA and IC aircraft had provision for either type, the Vickers "K" mounted above the "cabin" window or the Browning within the window itself.

The Wellington IC with the Pegasus XVIII was a most successful bomber, and a total of 2,685 was built. Its airframe and systems in general formed the basis for later Marks. In the Mk. IC, the Royal Air Force had initially an aeroplane in which the engineering was geared to the exigencies of the time.

By the time the Mk. IC entered Squadron service in force, the strategy of day bombing had changed into one of formation night bombing only. Operational experience had dictated the futility of attempting daylight raids at medium heights by unescorted large bombers though comparatively heavily armed. The failure of the reconnaissance and bombing sortie by 24 Wellington Is over the Schillig Roads and Wilhelmshaven on 18th December, 1939 with the loss of over half the formation, drove this lesson home forcibly.

MARK II

The design of the Wellington Mark II was begun in January 1938, with the Rolls-Royce Merlin as an alternative power unit, to use the most powerful engine available and to ensure the uninterrupted supply of Wellingtons in the event of delay in the production of air-cooled engines. Although the Mark II was primarily an engine change modification, some redesign was undertaken, based on experience gained from the Mark I and as previously mentioned, also embodied in the Mark IA. Because of a delay in the production of the Merlin X, the prototype Mark II, *L4250*, did not fly until 3rd March, 1939.

As compared with the Mark I, the main changes apart from the engines in the Wellington II were the introduction of Frazer-Nash turrets and the inclusion of a 24-volt electrical system. The oxygen system was also modified to suit the F.-N. turrets and the hydraulic system incorporated V.S.G. pumps to

provide a 1,000 lb./sq. in. power supply for main aircraft services with a secondary 300 lb./sq. in supply for the turret operation. Cabin heating was installed and an astrodome fitted.

Problems of balance and stability were encountered during test flying of the prototype, largely because of additional engine weight compared with design figures, the opposite rotation of the Merlin/propeller combination to that of the Bristol-engined Marks and the difference in shape of the Merlin nacelles. Among modifications made for the production Mark IIs was a larger tailplane and a stronger undercarriage with larger diameter wheels. By the end of 1939 the performance of the Mark II was superior to that of the Mark IC. Take-off and maximum speed were better and with the increased power developed by the Merlins, a higher all-up weight could be attained, either by a greater load of bombs or by increased range through carrying more fuel. With a higher ceiling and cruising speed, the Mark II possessed factors taken into consideration for further development.

These were the first 4,000 lb. bomb installation, the 40 mm. heavy gun experiment, the high altitude Mark VI Wellington and the Whittle turbo-jet engine test beds. Perhaps the most important of these was the "block-buster" bomb trials with Wellington II *W5389*, which led to some exciting moments with faulty parachute release gear, as the bomb was of the type with its descent controlled by this means. The final success of the exercise led to the approval of the 4,000 lb. bomb installation for all types in Bomber Command and to the use of even bigger bombs later on.

With the large bomb and other modifications such as tropicalisation, long range tanks, and so on, the all-up weight of the Wellington II was increased to 33,000 lb. as compared with the 6,300 lb. of the project B.9/32 or the 21,000 lb. of its prototype *K4049*. In later Marks, the all-up weight of the Wellington was to climb even higher and the resilience of the airframe to design development "stretch" prove even more remarkable.

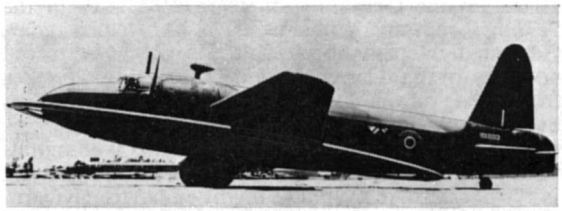
WELLINGTONS IN ACTION

As the Wellington set the pace in bomber design and development prior to World War II, so it measured up the tactical plans and preconceived theories of the air offensive against Germany when hostilities commenced on 3rd September, 1939. No. 3 Group of the Royal Air Force Bomber Command, equipped with Wellington Mark Is and IAs, was based in East Anglia on that date and comprised eight Squadrons, Nos. 9, 37, 38, 99, 115, 149 and the two Reserve Squadrons, Nos. 214 and 215.

On 4th September, 14 Wellingtons of 9 and 149 Squadrons raided Brunsbüttel, where two German warships had been reported by air reconnaisance. Bad weather and heavy anti-aircraft fire interfered with the action and two aircraft, which had penetrated the harbour, were lost. Others failed to locate the target while the bombs which did score hits were ineffective. In addition there was an embargo imposed by the War Cabinet on attacks on other than strictly military targets, which precluded the bombing of enemy ships in harbours, for fear of injuring civilians in the vicinity.

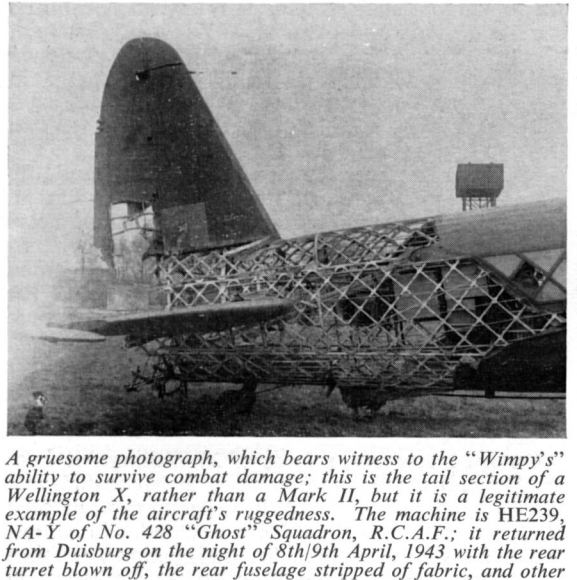
On 3rd December, a force of 24 Wellingtons from 38, 115 and 147 Squadrons based at Mildenhall and Marham, attacked units of the German fleet, moored at Heligoland, from "high" level in cloud, with almost negative results on either side. This action was taken to confirm that Wellingtons, with their turrets and strong geodetic construction and flying in close formation, could penetrate strongly defended areas.

This confidence was shaken on 14th December, when 12 Wellingtons of 99 Squadron penetrated the Schillig Roads near Wilhelmshaven at low level, under heavy fire from warships and flak-ships and fighters which came up to join combat. The Wellingtons maintained formation and shot it out but five were lost and one crashed when almost home, against



Mk. I, HX682, *one of several machines fitted with a 48-foot dural hoop energised by an auxiliary motor mounted in the fuselage. Appearing in January 1940, this modification was intended to detonate magnetic mines when the aircraft flew at a low altitude over mined channels. It was highly successful.*

A "mine-sweeper" Wellington DWI at work over the harbour at Tripoli, North Africa. Note the sunken vessels in the harbour. (Photo: Imp. War. Mus. CM 5201)



A gruesome photograph, which bears witness to the "Wimpy's" ability to survive combat damage; this is the tail section of a Wellington X, rather than a Mark II, but it is a legitimate example of the aircraft's ruggedness. The machine is HE239, *NA-Y of No. 428 "Ghost" Squadron, R.C.A.F.; it returned from Duisburg on the night of 8th/9th April, 1943 with the rear turret blown off, the rear fuselage stripped of fabric, and other serious damage; Sgt. L. F. Williamson, the Canadian pilot, was awarded the C.G.M. In the original print it is possible to distinguish small sections of ·303 ammunition belt from the tail turret still caught in the ragged ends of the structural members, behind the tail wheel. The motto of the "Ghost" squadron was* Usque ad finem-"*To the very end*"*; the unit emblem was a death's head.* (Photo: Imp. War Mus. CH 9868)

the loss of one enemy fighter.

Four days later, on 18th December, 24 Wellingtons from Nos. 9, 37 and 149 Squadrons attempted an attack on the German fleet and naval bases in the Schillig Roads and Wilhelmshaven. Alerted by radar, German fighters pounced on them near Heligoland and they were under continuous attack until 80 miles from home on the return flight, except when engaged by anti-aircraft guns of the naval bases. Although they covered the whole target area, the Wellingtons were unable to drop their bombs, as all vessels were in harbour where bombing might endanger civilians. Over half the force was lost in one way or another against the destruction of four German fighters.

Unescorted day bombing was thereafter abandoned and the Wellington force of Bomber Command was gradually built up into a weapon of attack on German industrial and communication targets through night raids. Lessons learned from the early daylight raids as regards the Wellington were that the Vickers turrets had insufficient traverse, that the "dustbin" ventral turret was useless against beam attacks from above and that self-sealing fuel tanks were essential to avoid disastrous fires caused by bullets puncturing the tanks, this allowing the petrol to spill out over the engines.

In the air war Wellingtons ranged over Germany, the Middle East and the Far East. They were introduced into Coastal Command to join the Battle of the Atlantic later on in specially developed variants. A Mark IA, *P2516*, was converted at the end of 1939 to carry a large electrically energised hoop of 48 ft. diameter as an enemy magnetic mine destroyer and the type, known as "DWI", was successfully used for this duty in British coastal waters and later in Mediterranean harbours and the Suez Canal.

The following tables are a complete record of Wellington production and service up to Mark II and testify in figures to the massive contribution of this famous aeroplane to British air power in the first part of World War II.

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Acknowledgement is made in the preparation of this Profile to the researches of W. G. Cox into the technical development of the basic Wellington design and to the compilation of the statistics by E. C. Morgan.

PRODUCTION AND SQUADRON ALLOCATION

1. Prototype, *K4049* first flew 15th June 1936. Ordered to Specification B.9/32. Crashed April 1937. Type 271.

2. 180 ordered to Specification B.29/36 on the 15th August 1936 as Wellington Mark I and as *L4212-L4311* and *L4317-L4391* under Contract No. 549268/36. *L4212* built as Type 285 with Pegasus X engines later converted to Type 290 with Pegasus XVIII engines. Remainder built as Type 290 also *R2699-R2703* as replacement aircraft giving total of 180. *L4250* converted to Type 298 Mark II prototype (interim). *L4251* converted to Type 299 Mark III prototype (interim). *L4311, L4330, L4340, L4350, L4355, L4360* for R.N.Z.A.F. as Type 403 and *NZ300-NZ305* but not delivered.

The following Squadrons received initial aircraft as listed in chronological order of reception.

99 Squadron *L4215-L4218, L4220, L4222, L4224-L4225, L4227-L4229, L4232, L4244, L4246-L4247*. First delivered 10th October 1938 last 12th January 1939. 38 Squadron *L4230-L4231, L4234-L4243, L4245, L4248, L4295-L4296*. First delivered 24th November 1938, last delivered 30th March 1939. 149 Squadron *L4249, L4252-L4259, L4263-L4266, L4270-L4272*. First delivered 20th January, last delivered 17th February 1939. 9 Squadron *L4260-L4262, L4268-L4269, L4273-L4279, L4286-L4288, L4320, L4322*. First delivered 31st January, last delivered 2nd May 1939. 148 Squadron *L4280-L4284, L4289-L4294, L4303-L4304, L4308*. First delivered 4th March, last delivered 19th April 1939. 115 Squadron *L4299-L4301, L4305-L4307, L4317-L4319, L4321, L4323-L4325, L4333-L4334*. First delivered 30th March, last delivered 16th May 1939. 37 Squadron *L4326-L4329, L4331-L4332, L4336-L4339, L4347-L4349, L4351-L4354*. First delivered 6th May, last delivered 15th June 1939. 75 Squadron *L4330, L4340, L4355, L4360, L4366-L4373*. First delivered May 1939, last delivered 11th July 1939. 214 Squadron *L4341-L4346, L4354, L4356-L4359, L4361-L4365*. First delivered in May, last delivered 28th June 1939. 215 Squadron *L4375-L4390*. First delivered 12th July, last delivered 1st August 1939.

L4255 converted for ambulance duties by Air Transport Auxiliary at White Waltham.

3. 100 Mark I ordered from Vickers, Chester, as *L7770-L7819, L7840-L7874, L7885-L7899* under Contract No. B.992424/39, and completed as 3 Mark I, 17 Mark 1A and 80 Mark IC. *L7770-L7772* Mark I. *L7773-L7789* Mark IA. *L7790-L7899* Mark IC. Most delivered direct into store at Maintenance Units for Modification and future delivery to operational units.

The following Mark IC's delivered direct to Squadrons: 37 Squadron *L7790-L7794, L7800*. First on 11th April 1940. 9 Squadron *L7795*. 115 Squadron *L7796*. 75 (NZ) Squadron *L7797*. 148 Squadron *L7798-L7801*. 99 Squadron *L7802-L7804*. 149 Squadron *L7805*. All delivered between the 4th August 1939 and the 27th June 1940. One, *L7776*, converted later to transport as C. Mk. XV.

4. 100 Mark IC, built at Chester under Contract No. B.124362/40 as *N2735-N2784, N2800-N2829* and *N2840-N2859*. All delivered initially to Maintenance Units between the 2nd July and the 22nd August 1940. Conversions to Mark XVI were *N2755, N2801, N2856* and *N2857*.

5. 120 Mark IA built at Weybridge under Contract No. 549268/36 as *N2865-N2914, N2935-N2964* and *N2980-N3019*. 12, (*NZ306-NZ317*) *N2874-N2879* and *N2937-N2942* originally allocated to the R.N.Z.A.F. but not delivered. Conversions to Mark XV were: *N2867, N2871, N2875, N2877, N2880, N2886, N2887, N2909, N2944, N2947, N2954, N2955* and *N2958*. Initial deliveries were to the following Squadrons:

149 Squadron *N2866-N2869, N2891-N2894, N2943-N2946, N2964, N2980-N2982*. 99 Squadron *N2870, N2911-N2914, N2959-N2962, N2999-N3006, N3008-N3009*. 37 Squadron *N2889-N2890, N2935-N2938, N2951-N2954, N2991-N2994*. 214 Squadron *N2871, N2875, N3007, N3010-N3013, N3019*. 9 Squadron *N2897-N2898, N2939-N2942, N2983-N2986, N3014-N3018*. 115 Squadron *N2877, N2947-N2950, N2987-N2990*. 38 Squadron *N2909, N2956-N2958, N2963, N2995-N2998*. All delivered between the 3rd November and the 27th December 1939.

6. 100 built at Weybridge under Contract No. 549268/36 as *P2519-P2532, P9205-P9250* and *P9265-P9300*. Built as 50 Mark IA and 50 Mark IC from *P9237*. Conversions: To D.W.I. *P2516* prototype conversion, also *P2518, P2521, P2511* and *P9223* as Type 418. To Mark III *P9238*. To Mark XV *P2519, P2521, P2528, P9209, P9222* and *P9231*. To Mark XVI *P9289*. All delivered between the 8th January and the 11th April 1940.

7. 550 Mark IC ordered from Chester under Contract No. 992424/39 as *R1000-R1049, R1060-R1099, R1135-R1184, R1210-R1254, R1265-R1299, R1320-R1349, R1365-R1414, R1435-R1474, R1490-R1539, R1585-R1629, R1640-R1669, R1695-R1729, R1757-R1806*. All built as IC except 25 converted to Mark IV as follows: *R1220, R1390, R1490, R1510, R1515, R1520, R1525, R1530, R1535. R1585, R1590. R1610. R1615. R1620. R1625, R1650, R1655, R1695, R1705, R1715, R1725, R1765, R1775, R1785, R1795*. Conversions to Mark XVI: *R1032, R1144, R1172, R1409, R1452, R1521, R1531, R1600, R1605, R1649, R1659, R1700, R1710-R1711* and *R1720*. All delivered between the 22nd August 1940 and June 1941.

8. 100 Mark IC ordered from Weybridge under Contract No. B.3913/39 as *R3150-R3179, R3195-R3239* and *R3275-R3299* but built as 97 Mark IC and three conversions on the production line as: *R3221* to Mark II and *R3298-R3299* to Mark V. Other conversions later were: To Mark XVI: *R3217, R3225, R3234* and *R3237*. All delivered between the 12th April and the 9th June 1940.

9. 300 Mark IC ordered from Weybridge under Contract No. B.38600/39 as *T2458-T2477, T2501-T2520, T2541-T2580, T2606-T2625, T2701-T2750, T2801-T2850, T2873-T2922* and *T2951-T3000* but built as follows: 293 Mark IC and conversions on line were: *T2545* to Mark II and *T2919, T2977, T2979, T2982, T2988* and *T2998* to Mark VIII. All delivered between the 19th June 1940 and the 7th February 1941.

10. 300 Mark II ordered from Weybridge under Contract No. B.71441/40 as *W5352-W5401, W5414-W5463, W5476-W5500, W5513-W5537, W5550-*

Wellington IC, R1448, of No. 218 (Gold Coast) Sqdn.; Marham, Suffolk, Summer 1941. The legend "Akyem Abuakwa" appeared under the cockpit in small white characters.

Wellington IC, R1006, of No. 301 "Pomeranian" (Polish) Sqdn.; Syerston, Nottinghamshire, January 1941.

Wellington IC, T2607, of No. 37 Sqdn.; landing ground LG 09, Western Desert, 1942.

Wellington IC, R1378, of No. 311 (Czechoslovakian) Sqdn.; East Wretham, Norfolk, March 1941.

Wellington II, Z8345, of No. 104 Sqdn.; Driffield, Yorkshire, U.K., 1941. Note beam gun positions.

Wellington II, W5537, of No. 405 (Vancouver) Sqdn.; Pocklington, Yorkshire, Summer 1941.

Wellington II, L4250, modified to test 40 mm. Vickers 'S' gun.

©WARD...

The Wellington in its natural environment; Bomber Command aircraft taxiing for take-off on a mission over Germany, as evening falls. On the night of the 30th May, 1942, no fewer than 599 Wellingtons took part in the 1,000 bomber raid on Cologne.
(Photo: Imp. War Mus. CH 10246)

W5598, *W5611-W5631*, *W5644-W5690* and *W5703-W5735*. Built as 74 Mark IC, 199 Mark II and 27 Mark VIII. *W5352* Mark IC cross-referred to *T2545* Mark II. Mark IC from *W5612* except for the Mark VIII's which were: *W5615*, *W5619*, *W5623*, *W5631*, *W5645*, *W5647*, *W5649*, *W5651*, *W5653*, *W5655*, *W5657*, *W5659*, *W5661-W5662*, *W5671-W5672*, *W5674*, *W5676*, *W5678*, *W5725*, *W5728*, *W5730-W5735*. Conversions to Mark XIV were: *W5686* and *W5709*. Specials were: *W5389/G* fitted R.R. Merlin 60's and wings from Mark VI aircraft and also fitted with Rover W2B in tail in place of tail turret. Maximum altitude reached was 33,000 ft. *W5518/G* fitted W2/700 in tail, maximum altitude reached 36,000 ft. All initially delivered to Maintenance Units between the 7th October 1940 and the 4th May 1941.

11. 500 Mark IC ordered from Blackpool under Contract No. B.92439/40/C.4(c) as *X3160-X3179*, *X3192-X3226*, *X3275-X3289*, *X3304-X3313*, *X3330-X3374*, *X3387-X3426*, *X3445-X3489*, *X3538-X3567*, *X3584-X3608*, *X3633-X3677*, *X3694-X3728*, *X3741-X3765*, *X3784-X3823*, *X3866-X3890*, *X3923-X3967* and *X3984-X4003*. Only 50 Mark IC produced *X3160-X3179* and *X3192-X3221*, rest were Mark III and these were delivered straight to Maintenance Units from the 8th August 1940. *X3193* and *X3935* were converted to Mark XVI.

12. 710 Mark IC ordered from Chester under Contract No. 124362/40 as *X9600-X9644*, *X9658-X9707*, *X9733-X9767*, *X9785-X9834*, *X9871-X9890*, *X9905-X9954*, *X9974-X9993*, *Z1040-Z1054*, *Z1066-Z1115*, *Z1139-Z1183*, *Z1202-Z1221*, *Z1243-Z1292*, *Z1311-Z1345*, *Z1375-Z1424*, *Z1459-Z1496*, *Z1562-Z1578*, *Z1592-Z1626*, *Z1648-Z1697* and *Z1717-Z1751*. Only 378 built as Mark IC *X9600-Z1181*. All delivered initially to Maintenance Units from the 10th May 1941. Conversions to Mark XVI were: *X9663*, *X9678*, *Z1071* and *Z1150*. First delivered was *X9600* 10th May 1941. Last Mark IC delivered was *Z1181* "*Gorakhpur*" on the 9th March 1942.

13. 200 Mark II built by Weybridge under Contract No. B.71441/40 as *Z8328-Z8377*, *Z8397-Z8441*, *Z8489-Z8538*, *Z8567-Z8601* and *Z8643-Z8662*. All initially delivered to Maintenance Units between the 14th July 1941 and the 30th June 1942. Specials were: *Z8416/G* fitted with 40 mm. "S" gun in nose. *Z8570/G* fitted with B.T.H. W.2B Jet in place of tail turret.

14. 250 Mark IC ordered from Weybridge under Contract No. B.71441/40 as *Z8702-Z8736*, *Z8761-Z8810*, *Z8827-Z8871*, *Z8891-Z8910*, *Z8942-Z8991*, *Z9016-Z9045* and *Z9095-Z9114*. 21 conversions to Mark VIII were *Z8702-Z8703*, *Z8705-Z8708*, *Z8710*, *Z8712-Z8713*, *Z8715*, *Z8717*, *Z8719*, *Z8721*, *Z8723*, *Z8725*, *Z8727*, *Z8892*, *Z8895*, *Z8898*, *Z8902* and *Z8906*. All initially delivered to Maintenance Units between 7th May 1941 and 30th November 1941. Three subsequent conversions to Mark XVI were: *Z8709*, *Z8831* and *Z8850*.

15. 50 Mark IC built by Weybridge under Contract No. B.71441/40 as *AD589-AD608* and *AD624-AD653*. *AD646* Torpedo bomber prototype tested by T.D.U. at Gosport. All delivered to Maintenance Units with 41 of them subsequently going to the Middle East for operations with No's 37, 40, 70, 108 and 148 Squadrons. All delivered between the 6th December 1941 and 5th January 1942.

16. 150 Mark IC ordered from Weybridge under Contract No. B.71441/40 as *BB455-BB484*, *BB497-BB541*, *BB566-BB600* and *BB617-BB656*. Only 50 delivered, *BB455-BB484* and *BB497-BB516* as 43 Mark IC and 7 Mark VIII (*BB461*, *BB466*, *BB471*, *BB476*, *BB481*, *BB503* and *BB513*) rest cancelled. All delivered initially to Maintenance Units between the 6th January and the 11th February 1942.

17. 415 Mark IC built by Chester under Contract No. 124362/40 as *DV411-458*, *DV473-DV522*, *DV536-DV579*, *DV593-DV624*, *DV638-DV678*, *DV694-DV740*, *DV757-DV786*, *DV799-DV846*, *DV864-DV898* & *DV914-DV953*. All delivered initially to Maintenance Units between the 11th November 1941 and the 13th June 1942. Conversions to Mark XVI were: *DV491*, *DV594*, *DV617*, *DV704*, *DV738*, *DV761-DV762*, *DV822*, *DV886*, *DV920-DV921*, *DV924* and *DV942*.

18. 16 Mark IC built at Weybridge under Contract No. B.71441/40 as *ES980-ES995* with *ES986* converted to a Mark VIII fitted with a Leigh lamp. All delivered initially to Maintenance Units between the 10th and 19th of Februay 1942.

19. 1,382 Mark IC ordered from Chester under Contract No. 124362/40 with serials between *HD942* and *HF606*. Only 85 Mark IC produced, *HD942-HD991*, *HE101-HE134* and *HE146*, rest built under amended contract as 789 Mark X, 8 Mark XII and 242 Mark XIV. All 85 delivered to Maintenance Units between the 13th June and November 1942.

20. 84 built by Weybridge under Contract No. B.71441/40 as *HF828-HF869* and *HF881-HF922* and as 62 Mark IC and 22 Mark VII as follows: *HF828*, *HF838*, *HF850*, *HF854*, *HF857*, *HF860*, *HF863*, *HF866*, *HF869*, *HF883*, *HF886*, *HF889*, *HF892*, *HF895*, *HF901*, *HF904*, *HF907*, *HF910*, *HF913*, *HF916*, *HF919* and *HF922*. All delivered initially to Maintenance Units between the 19th February and the 11th April 1942.

21. 300 built at Weybridge under Contract No. B.71441/40 as *HX364-HX403*, *HX417-HX452*, *HX466-HX489*, *HX504-HX538*, *HX558-HX606*, *HX625-HX656*, *HX670-HX690*, *HX709-HX751* and *HX767-HX786* with 124 Mark IC and 176 Mark VIII. All Mark IC delivered initially to Maintenance Units between the 12th April and the 18th September 1942. Mark IC's as follows: *HX364-HX371*, *HX373-HX375*, *HX377-NX378*, *HX380*, *HX382*, *HX384-HX385*. *HX387*, *HX389-HX390*, *HX392-HX393*, *HX395*, *HX397*, *HX399-HX400*, *HX402*, *HX417*, *HX421*, *HX423*, *HX425*, *HX429*, *HX431*, *HX433*, *HX435*, *HX438*, *HX440*, *HX442*, *HX446-HX447*, *HX449*, *HX451*, *HX468*, *HX470*, *HX472*, *HX476*, *HX478*, *HX480*, *HX483-HX484*, *HX486*, *HX488*, *HX506*, *HX508*, *HX510*, *HX514*, *HX516*, *HX518*, *HX521*, *HX523*, *HX525*, *HX527*, *HX529*, *HX533*, *HX536*, *HX558*, *HX560*, *HX564*, *HX567*, *HX569*, *HX571*, *HX573*, *HX577*, *HX580*, *HX583*, *HX585*, *HX589*, *HX591*, *HX594*, *HX597*, *HX601*, *HX603*, *HX606*, *HX627*, *HX631*, *HX633*, *HX635*, *HX637*, *HX639*, *HX643*, *HX645*, *HX648*, *HX651*, *HX655*, *HX670*, *HX673*, *HX676*, *HX680*, *HX682*, *HX685*, *HX688*, *HX710*, *HX712*, *HX714*, *HX716*, *HX718*, *HX722*, *HX724*, *HX727*, *HX730*, *HX734*, *HX736*, *HX739*, *HX742*, *HX746*, *HX748*, *HX750*, *HX767*, *HX769*, *HX773*, *HX775*, *HX778*, *HX781* and *HX785*.

22. 150 built at Weybridge under Contract No. B.71441/40 as *LA964-LA998*, *LB110-LB156*, *LB169-LB197* and *LB213-LB251* of which only 16 were Mark IC as follows: *LA965*, *LA968*, *LA973*, *LA978*, *LA984*, *LA988*, *LA994*, *LB110*, *LB116*, *LB120*, *LB126*, *LB131*, *LB141*, *LB148*, *LB152* and *LB174*. Delivered initially to Maintenance Units between the 19th September and the 31st October 1942.

WELLINGTON UNITS

Squadrons using Marks I, IA and IC
9, 15, 37, 38, 40, 57, 69, 70, 75, 93, 99, 101, 103, 105, 108, 109, 115, 148, 149, 150, 156, 162, 172, 192, 214, 215, 218, 300, 301, 304, 305, 311, 415, 419 and 458.

Squadrons using Mark II
12, 37, 38, 40, 99, 104, 115, 142, 158, 214, 218, 305 and 405.

O.T.U's
3, 6, 7, 11, 12, 14, 15, 16, 17, 18, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30 and 105.

Other Units

No. 1 A.A.S.	No. 3 B.A.T. Flt.
C.G.S.	No. 3 G.T. Flt.
Flight Refuelling Ltd.	N. 9 B.A.T. Flt.
No. 2 G.A.S.	No. 10 B.A.T. Flt.
No. 2 G.R.U.	1418 Flt.
No. 3 G.R.U.	1429 Flt.
Special Duty Flight Christchurch	1443 F. Flt., 1446 F. Flt., 1473 Flt., 1474 Flt., 1481 T.T. Flt., 1483 T.T. Flt. 1503 Flt., 1504 B.A.T. Flt., 1505 B.A.T. Flt., 1508 Flt.

TOTAL NUMBERS BUILT

183 Mark I, 183 Mark IA, 4 Mark D.W.I., 2,685 Mark IC, 401 Mark II

SPECIFICATION

	P	Mk. I	IA	IC	II
	271	290	408	415	406
TARE (lb.)	11,508		18,962	19,002	20,258
LOADED (lb.)	21,000	24,850		30,000	33,000
TOP (m.p.h.)	250	265		243	270
HEIGHT (ft.)	8,000	17,000		15,500	17,750
RANGE (miles)	2,800	3,200		1,800	2,200
CRUISE (m.p.h.)		180		180	180
CRUISE HEIGHT (ft.)		15,000		15,000	19,700
S.C. (ft.)		26,300		21,000	23,500
B.L. (Normal) (lb.)				2,500	2,500
B.L. (Overload) (lb.)	4,500	4,500		4,500	4,000
ARMS	2 Lewis	4 mgs		4 mgs	4 mgs
Dimensions Prototype:	Span 85 ft. 10 ins.		Length 60 ft. 6 ins.		
Production:	Span 86 ft. 2 in.		Length 64 ft. 7 in.		
	Height 17 ft. 5 in.		Wing Area 850 sq. ft.		

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